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10/622,403	07/18/2003	Richard C. Slater	TXT05-06	4136

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EXAMINER	
VAN ROY, TOD THOMAS	
ART UNIT	**PAPER NUMBER**
2828	

DATE MAILED: 10/20/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/622,403	SLATER, RICHARD C.	
	Examiner	Art Unit	
	Tod T. Van Roy	2828	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *14 August 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-29,31,32,34 and 35* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-29,31-32,34-35* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

The examiner acknowledges the amending of claims 1, 24, 31, and 34, and the cancellation of claims 30 and 33.

Response to Arguments

Applicant's arguments, see Remarks, filed 08/14/2006, with respect to the rejection(s) of claim(s) 1 under USC 102(b) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of newly found prior art.

The examiner agrees with the applicant that the Seguin reference appears to teach the electromagnetic fields produced do not in fact overlap with multiple gain regions.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-4, 6, 8-10, 18-19, 21-22, 24-25, 27-29, 31-32, and 34-35 are rejected under 35 U.S.C. 102(b) as being anticipated by Reilly (US 6215807).

With respect to claims 1, 4, and 18, Reilly discloses a system for coherent beam combination comprising: an unstable resonator (col.3 lines 7-8), at least two gain media located within said unstable resonator (col.6 lines 57-60, laser gain media-col.1 lines11-

15, 8 shown in the figure) wherein a first electromagnetic field produced by a first gain medium of said at least two gain media propagates through a portion of a second gain medium after one or more round trips within said unstable resonator (cols.8-9 lines 59-31, feedback through multiple mediums), wherein said first electromagnetic field is in-phase with a second electromagnetic field produced by the second gain medium (abs.), and wherein the at least two gain media are placed in a plane transverse to a longitudinal axis of the unstable resonator, each gain medium being positioned an equal distance away from and on a different side of the longitudinal axis of the unstable resonator (fig.1 slabs symmetrically placed on either side of the longitudinal axis).

With respect to claim 2, Reilly further discloses an output beam existing said unstable resonator (fig.1 #62).

With respect to claim 3, Reilly further discloses the output beam has an intensity proportional to an amplitude product squared, said amplitude product being an amplitude of said first electromagnetic field multiplied by an amplitude of said second electromagnetic field (beam is amplified at each gain element, product then output at end of the resonator).

With respect to claim 6, Reilly further discloses the first and second gain media are separated by about 100um to about 5mm (3mm, col.9 lines 12-15).

With respect to claims 8-10, Reilly further discloses heat conducting elements in contact with the laser gain medias (fig.17), contacting the gain media parallel to the longitudinal axis (in line with the media), and are in a plane transverse to the longitudinal axis (formed along side the media).

With respect to claim 19, Reilly further discloses the gain media form a 2x2 array (seen in fig.1).

With respect to claims 21-22, Reilly further discloses the resonator is confocal-convex (col.3 lines 11-12).

With respect to claim 24, Reilly discloses a method for coherent beam combination comprising the steps of: producing a first electromagnetic field from a first gain medium; producing a second electromagnetic field from a second gain medium (fig.1, fields produced by pumping the gain media, then being reflected through successive gain media); expanding said first and said second electromagnetic fields in an unstable resonator having a magnification factor (inherent in an unstable resonator, see applicant's spec [0020]); and coherently combining said expanded first electromagnetic field with said expanded second electromagnetic field (abs., accomplished through the in-phase reflections through the gain media), wherein said first electromagnetic field is in-phase with a second electromagnetic field produced by the second gain medium (abs.), and wherein the at least two gain media are placed in a plane transverse to a longitudinal axis of the unstable resonator, each gain medium being positioned an equal distance away from and on a different side of the longitudinal axis of the unstable resonator (fig.1 slabs symmetrically placed on either side of the longitudinal axis).

With respect to claim 25, Reilly further discloses the output beam has an intensity proportional to an amplitude product squared, said amplitude product being an amplitude of said first electromagnetic field multiplied by an amplitude of said second

electromagnetic field (beam is amplified at each gain element, product then output at end of the resonator).

With respect to claims 27-28, Reilly further discloses producing a third electromagnetic field (fig.1, at least 8 fields produced in this embodiment), and expanding said third electromagnetic field in said unstable resonator to coherently combine the third field with the first and second fields (abs., cols.8-9 lines 59-31).

With respect to claim 29, Reilly further discloses removing heat from the gain media (fig.17).

With respect to claims 31-32 and 34-35, Reilly further discloses the at least two gain media are located near the midpoint of the distance between first (fig.4 #36) and second mirrors (fig.4 #45) of the unstable resonator, and near the midpoint of the length of the resonator (fig.4).

Claims 1, and 20-23 are rejected under 35 U.S.C. 102(b) as being anticipated by Sziklas (US 4170405).

With respect to claim 1, Sziklas discloses a system for coherent beam combination comprising: an unstable resonator (abs.), at least two gain media located within said unstable resonator (fig.5) wherein a first electromagnetic field produced by a first gain medium of said at least two gain media propagates through a portion of a second gain medium after one or more round trips within said unstable resonator (fig.5), wherein said first electromagnetic field is in-phase with a second electromagnetic field produced by the second gain medium (col.5 lines 8-16), and wherein the at least two

gain media are placed in a plane transverse to a longitudinal axis of the unstable resonator, each gain medium being positioned an equal distance away from and on a different side of the longitudinal axis of the unstable resonator (fig.5 symmetrically placed on either side of the longitudinal axis).

With respect to claims 20-21, Sziklas discloses the unstable resonator is a positive branch confocal resonator (col.4 lines 15-16).

With respect to claim 22, Sziklas discloses the unstable resonator is confocal-convex (col.3 line 65).

With respect to claim 23, Sziklas discloses the unstable resonator is a ring resonator (fig.5).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Reilly (US 6215807).

With respect to claim 7, Reilly teaches the system as outlined in the rejection to claim 6 above, including the importance of gain spacing (see above rejection) but does not specify the separation distance be about 1mm. It would have been obvious to one of ordinary skill in the art at the time of the invention to optimize the range through experiment as this has been shown to be within the skill of a general worker in the art (see MPEP 2144.05 II A - In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955) – speaking of the fact that it is not inventive to discover the optimum or workable ranges by routine experimentation, i.e. changing the spacing between the gain media)

Claims 5, 15, 17, and 26 rejected under 35 U.S.C. 103(a) as being unpatentable over Reilly in view of Tanuma (US 5561550).

With respect to claims 5, 15, and 17, Reilly teaches the system as described in the rejection to claim 1 above, but does not teach the use of parametric gain media. Tanuma teaches an unstable optical resonator (col.2 lines 58-60) wherein Lithium Niobate is used (col.1 lines 22-28). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the system of Reilly with the Lithium Niobate of Tanuma to utilize the parametric media's wavelength conversion abilities (col.1 lines 22-28) for use in industrial applications where specific wavelengths are needed and can be combined with the unstable resonator's high output power, as well as the ability of the media to provide gain in the resonator.

A reference noted, but not relied upon, is that of Benda et al. (US 5173907), which discloses an unstable resonator (abs.), and further teaches the obviousness of replacing a gas gain media with that of a solid-state type (col.3 lines 33-45).

With respect to claim 26, Reilly teaches the method of claim 24, but does not teach signal or idler fields to be present. Tanuma teaches the use of Lithium Niobate in an unstable resonator, the reasons for incorporation given above, wherein the use of the parametric media in the resonator would inherently form both signal and idler fields.

Claims 5, 14, and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Reilly in view of Velsko et al. (US 6421166).

With respect to claims 5, 14, and 16, Reilly teaches the system as described in the rejection to claim 1 above, but does not teach the use of parametric gain media. Velsko teaches an unstable resonator (claim 8) wherein PPLN (col.2 lines 50-53) is used. It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the system of Reilly with the parametric gain media of Velsko to achieve highly efficient frequency conversion (col.1 lines 55-62) for use in industrial applications where specific wavelengths are needed and can be combined with the unstable resonator's high output power, as well as the ability of the media to provide gain in the resonator.

A reference noted, but not relied upon, is that of Benda et al. (US 5173907), which discloses an unstable resonator (abs.), and further teaches the obviousness of replacing a gas gain media with that of a solid-state type (col.3 lines 33-45).

Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Reilly in view of Vetrovec (US 2002/0172253).

With respect to claim 13, Reilly teaches the system outlined in the rejection to claim 1 above, but does not teach the use of solid state gain media. Vetrovec teaches an unstable resonator wherein Ti:Saphhire is utilized. It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the unstable resonator of Reilly with the gain material of Vetrovec in order to make use of a specific wavelength range found in Ti:Saphhire lasers.

A reference noted, but not relied upon, is that of Benda et al. (US 5173907), which discloses an unstable resonator (abs.), and further teaches the obviousness of replacing a gas gain media with that of a solid-state type (col.3 lines 33-45).

Claims 11 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Reilly and Vetrovec in view of Mooradian (US 5115445).

With respect to claims 11 and 12, Reilly and Vetrovec teach the system as outlined in the rejection to claim 13 above, but do not teach the heat conducting element to be made of optical quality diamond. Mooradian teaches an unstable resonator (col.6 lines 50-53) wherein an optical quality diamond is used to remove heat from the gain media (col.5 lines 15-29, obvious the diamond is of optical quality as it is directly in the beam path, fig.1 #16). It would have been obvious to one of ordinary skill in the art at

the time of the invention to combine the heat conducting element of Reilly and Vetrovec with the optical quality diamond material of Mooradian as diamond is known to have a good heat conductivity (col.5 lines 20-25) and would potentially eliminate the need for additional fluid cooling, and hole drilling (for beam passage, due to the optical quality material being used) of the heat conducting structure.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tod T. Van Roy whose telephone number is (571)272-8447. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Minsun Harvey can be reached on (571)272-1835. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

TVR

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PRIMARY EXAMINER